



## Early Journal Content on JSTOR, Free to Anyone in the World

This article is one of nearly 500,000 scholarly works digitized and made freely available to everyone in the world by JSTOR.

Known as the Early Journal Content, this set of works include research articles, news, letters, and other writings published in more than 200 of the oldest leading academic journals. The works date from the mid-seventeenth to the early twentieth centuries.

We encourage people to read and share the Early Journal Content openly and to tell others that this resource exists. People may post this content online or redistribute in any way for non-commercial purposes.

Read more about Early Journal Content at <http://about.jstor.org/participate-jstor/individuals/early-journal-content>.

JSTOR is a digital library of academic journals, books, and primary source objects. JSTOR helps people discover, use, and build upon a wide range of content through a powerful research and teaching platform, and preserves this content for future generations. JSTOR is part of ITHAKA, a not-for-profit organization that also includes Ithaka S+R and Portico. For more information about JSTOR, please contact [support@jstor.org](mailto:support@jstor.org).

## PUBLIC HEALTH REPORTS.

---

### UNITED STATES.

*Report of the commission appointed by the Secretary of the Treasury for the independent investigation of plague in San Francisco.*

SAN FRANCISCO, CAL., February 26, 1901.

SIR: The special commission appointed by the honorable the Secretary of the Treasury for the purpose of ascertaining the existence or nonexistence of bubonic plague in San Francisco, or other ports or places in the State of California under instructions furnished by the Surgeon-General of the United States Marine-Hospital Service begs leave to submit the following report:

In accordance with instructions received, the members of the commission proceeded as early as possible to San Francisco, one of them (Dr. Barker), arriving on Friday, January 25, 1901, the other two (Dr. Flexner and Dr. Novy) on Sunday, January 27.

The first formal meeting of the commission was held at the Occidental Hotel shortly after the arrival of all the members. At this meeting it was decided, in accordance with your instructions, to call and pay our respects to the honorable, the governor of the State, to place ourselves in communication with the local authorities in order to obtain facilities for the examination of the sick and dead in Chinatown, or elsewhere should suspected cases arise, and to arrange for a laboratory in which pathological and bacteriological examinations could be undertaken.

Owing to the miscarriage of a letter sent to the commission by the honorable the governor of the State, the call of your commissioners upon him was delayed until Saturday, February 16. On this date, however, they had the privilege of paying their respects to the governor and of informing him of their orders. The governor received your commissioners most courteously and stated that the authorities in California desired to facilitate by every means in their power the investigation concerned.

A call was also made upon the mayor of the city of San Francisco and upon the president of the city board of health, both of whom offered to aid, in any way possible to them, the work of your commissioners. The city board of health supplied the commission with a map of Chinatown, on which were charted the location of cases which the board had examined and regarded as plague.

During the first fifteen days of our visit a bureau was opened in the Occidental Hotel; the commission met at 11 o'clock daily, and it was announced in the press that its members would be glad to confer with anyone who had information to give with regard to the existence or nonexistence of plague in the city. In addition, letters were sent to a number of physicians in town requesting an interview. The majority of those written to responded; opinions were divided, some of the phy-

sicians being confident that plague existed, others being sure that the disease was not here. The establishment of this bureau proved to be of great service, not so much in affording us information about plague as in putting us into relation with the medical and business interests of the city. Through it a plan of work became easy to formulate; through it we learned how to gain access to the sick and dead Chinese and how to proceed without exciting the opposition or suspicion of those among whom we were to work.

The representatives of the principal commercial interests of the city of San Francisco, including the Merchants' Association, the Manufacturers and Producers' Association, the Board of Trade, the Pacific Coast Jobbers and Manufacturers' Association, the Chamber of Commerce, the Pacific Mail Steamship Company, and the Southern Pacific Railway, called upon the commission, welcomed them to California, and offered their aid. Through the courtesy of Colonel Mendel, room 161 of the city hall, previously used as a license office, was put at the disposal of the commission. It was fitted out as a laboratory, the outfit being purchased new in San Francisco.

#### INSPECTIONS OF THE CHINESE SICK AND DEAD.

The attorney of the Chinese Consolidated Benevolent Associations (ordinarily known as the Chinese Six Companies) advised the Chinese to cooperate with the commission. As a result, proclamations were issued ordering the Chinese to report all cases of sickness and death, no matter what the cause, to the offices of the Chinese Six Companies in order that daily inspections might be made. Mr. Wong Chung, the secretary of the Six Companies, accompanied a member of the commission (Barker) daily to each house whence a report had been made, aided in finding the cases, acted as interpreter, and assisted in obtaining the necessary histories. It is believed by the members of the commission that the Chinese Six Companies acted in good faith and that they made every attempt to give access to the sick. Certain cases of sickness, it is true, were not reported and were not known of until the dead bodies were found, but this, it is believed, was due to negligence on the part of the Chinese concerned rather than to any attempt at concealment.

The daily inspections of the sick and dead permitted of observations relative to the mode of life of the people in the 14 blocks of San Francisco which make up "Chinatown." These observations were extended by special trips of inspection under the guidance of officers of the city detective force and by numerous independent trips of inspection made by your commissioners.

The dwellings of the poorer classes of Chinese were found to be here, as they seem to be everywhere, shockingly unsanitary. In places there is marked overcrowding; the rooms are small; they are often entirely devoid of light or means of ventilation, and nearly always insufficiently lighted and ventilated; many of them are filthy; some of them, especially those situated in basements, are damp and emit a foul stench. These faults in sanitation are not confined to the tenement houses of the Chinese; on the contrary, in the rear of, or over or under, some of the more pretentious business buildings are to be found sleeping and living apartments which are most objectionable from a sanitary point of view.

The Chinese in San Francisco, are however, in many respects much better off than are their countrymen in great native centers like Canton or even than those in a city like Hongkong. There is almost an entire

absence of the utter destitution met with among many of the Chinese in Asia; the Chinese in San Francisco are, on the whole, very well fed, for wages are high and food is abundant and cheap. They are also well clothed as a rule and particular emphasis is to be laid upon the fact that the Chinese here wear shoes, stockings, and trousers, since it is believed by many that the bare legs and feet of the Chinese in Hong-kong and Canton had much to do with the frequency of infection with plague in those places.

A large percentage of the Chinese in San Francisco, it is said, smoke opium. There are a number of Chinese prostitutes, but inspection of the quarters occupied by the latter would indicate that the rooms in which they live are on the whole more wholesome as regards air space, light, ventilation, and cleanliness, than those of the other inhabitants of the district.

On Wednesday, February 6, 1901, systematic daily rounds of visits were made by one of the commissioners in company of Mr. Wong Chung to the rooms of the sick as reported each day to the offices of the Chinese Six Companies. Rapid clinical examinations were made and notes kept of the results. A number of the cases met with were obviously instances of advanced tuberculosis; others were affected with various chronic diseases. Such cases, being of no interest for the investigation, were visited only once. When patients were found who presented symptoms which were suggestive of plague, a careful examination was made. In doubtful cases the first visit was followed by others and the progress of the illness carefully watched. These regular visits of daily inspection were maintained until February 16, 1901, during which period a sufficient number of instances had been observed to permit your commissioners to conclude beyond possible doubt that cases of bubonic plague were occurring among the Chinese.

Inspections of the dead in Chinatown were made also daily by the same member of the commission, beginning February 5, 1901. Access to the dead was gained in two ways. In the first place the assistant city physician, Dr. F. P. Wilson, makes the rounds of the undertaking establishments in Chinatown each forenoon. He inspects the bodies of the dead, and where necessary advises a pathological and bacteriological examination by Dr. Kellogg, the bacteriologist of the city board of health. Permission was obtained from these gentlemen for the making of simultaneous and independent inspections and of pathological and bacteriological examinations by the commission.

A second mode of access to the dead was that afforded by the reports made by the Chinese directly to the offices of the Six Companies. By this mode, it was in some instances possible to learn of the death of individuals and to make inspections of bodies before the city officials were informed of them.

From February 5 to February 16, 13 dead Chinese were inspected as follows:

*Death 1* (inspected February 5).—Chun Ah Chou, age 44, actor, died this morning in Washington Street Theater. Body well nourished; two or three dark bluish spots on legs (possible hemorrhages). On palpation of the neck, axillæ, and groins, some enlargement of the lymphatic glands of the left groin was made out, though nothing corresponding to an outspoken bubo was visible. Inspecting commissioner advised a pathological and bacteriological examination in order to remove all doubt as to the nature of the case. The results proved the case to be one of infection with plague (*vide infra*—laboratory case 1).

*Death 2* (inspected February 5).—Wong Koong Chin, elderly Chinese

male, died at 6a Waverly Place; history of dyspnoea and cyanosis for a long time before death. There is marked oedema of legs; no enlargement of lymphatic glands ascertainable on palpation. Death certificate signed by city physician as due to valvular disease of the heart. Case was not regarded as suspicious and no pathological or bacteriological examination was insisted upon.

*Death 3* (inspected February 5).—Lee Kee, middle-age Chinaman, found dead at 917½ Stockton street. This man had been visited by members of the commission 2 nights before, the case having been reported to them as one suspected of being plague. Neither when seen during life nor on inspection after death was anything seen which pointed to infection with plague. No enlargement of lymphatic glands could be made out. A pathological and bacteriological examination was, however, deemed advisable for purposes of exclusion. The results as regards plague were negative (*vide infra*—laboratory case 2). The assistant city physician attributed the death to intestinal obstruction.

*Death 4* (inspected February 6).—Fong Sha Song, coolie, age 56, found dead in "hall of tranquility" at rear of 1111 Stockton street. No available history of condition *intra vitam*; body filthy; oedema of legs; no enlarged lymphatic glands; no visible hemorrhages; pathological and bacteriological examination advised for purposes of exclusion. Results negative as regards plague (*vide infra*—laboratory case 4). Death attributed by city physician to interstitial nephritis.

*Death 5* (inspected February 6).—Lum Hong Yuen, died in room 15, third floor, at 28 Ross alley. Body found at Main Fook's undertaking establishment at 740 Pacific street. Through Mr. Wong Chung, the secretary of the Six Companies, a school teacher who knew deceased stated that the man had been ill about three weeks; that he had been a cook and waiter in the Chinese Theater up to three weeks ago, when he quit work on account of chancre and bubo; that since then he has been in his own room in Ross alley; that four or five days before his death he was given medicine by a Chinese doctor for a chill; that said medicine was too strong for the patient, and that "his breathing stopped and he died."

On inspection of the body no evidence of chancre could be found; in the inguino-femoral region a large mass of swollen conglomerated lymphatic glands could be felt. The swelling was so like similar swellings previously observed in cases of plague in Hongkong and in India that the case was regarded as almost certainly one of plague. Pathological and bacteriological examinations were made at once; the results proved the correctness of the impression gained from inspection (*vide infra*—laboratory case 3).

*Death 6* (inspected February 7).—Wong Chi Lui; age 45; cigar maker, who had worked at 418 Battery street; found dead at 18½ (21½) Waverly place. Through Mr. Wong Chung it was ascertained that the man had been ill for about two weeks, complaining of fever, loss of appetite, and general uneasiness. He had had pains in groins and lower abdomen, to which region a Chinese doctor had applied honey and salve. No history of venereal disease. For three or four days prior to death the man was unconscious. When chided by Mr. Wong Chung for not having reported the case earlier to the Six Companies, the brother of the deceased said he had not made a report because he had believed that the patient would soon be well.

On inspection and palpation a large mass of swollen glands was discovered in the left inguino-femoral region. It seemed likely that the case was one of plague and the friends of the deceased were notified

that an examination of the body would be made immediately. The pathological and bacteriological examination established the death as one due to infection with bacillus pestis (*vide infra*—laboratory case 5.)

*Death 7* (inspected February 11).—Tom Shom; male; age 51; actor in Chinese Theater; room above theater at 814 Washington street, near room of late Chum Ah Chou (see death 1). This man was reported as ill to the Six Companies, and was examined clinically on Friday February 8 by Dr. Barker, who obtained the following history: The man had been acting in the theater about two weeks before, although it had been stated that he had not been very well for from six to seven months previously. On February 4 he became seriously ill with fever and delirium. There has been some vomiting. The urine, as observed by the attendant, was described as brandy colored. He had a Chinese doctor in attendance, and his friends had not considered him ill enough to make a report to the Six Companies worth while. The man smoked about 50 cents worth of opium daily. On clinical examination the patient was found lying upon his back in bed with legs drawn up; he was in a state of semistupor. His pulse was 108, quick, rather full, but of low tension. The skin was hot and dry; respiration 20 to the minute. The face had an anxious expression; the tongue was coated in the middle. There was no palpable enlargement of the glands of the neck or axillæ, but in the right groin several slightly enlarged glands could be distinctly felt, and the patient, though his mind was partially clouded, winced decidedly when either groin was palpated. It was evident that the glands were quite tender. In the absence of urethral discharge, chancre or evidence of local irritation in the lower extremities, the case was, on account of the local and general phenomena, regarded as one of plague. The skin was cleansed and a sterilized hypodermic needle introduced into the groin. A few drops of bloody fluid were withdrawn, presumably from one of the enlarged glands. It was difficult to be sure of this however, as the patient could not be kept quiet while the needle was being inserted. No colonies of plague bacilli developed in the inoculated tube. The necropsy subsequently made indicated that the needle had failed to enter an enlarged gland.

The patient was seen on the following day, when his condition showed no change for the better. The pulse was 136 and feebler, the patient seemed in general weaker, and an unfavorable prognosis was made. The patient's friends were told that an injection of Yersin's serum offered the best chances for recovery, though they were also told that not much could be hoped from any treatment in the stage of the disease in which patient then was. The offer was refused. The man died on February 10, the next day.

The dead body was inspected on the morning of February 11. The body was in a state of firm rigor mortis, the limbs being strongly flexed. On breaking down the rigor mortis and palpating the glands in the groin, it was difficult to say positively that there was any enlargement of the lymphatic glands. In view of the enlargement distinctly made out during life and the clinical picture which had been observed, the death was believed to be one due to plague and a pathological and bacteriological examination undertaken. The results indicated clearly the existence of infection with *B. pestis* (*vide infra*—laboratory case 6).

*Death 8* (inspected February 11).—Chung Moon Woo She, wife of Chung Toy Ding, living in a cellar at 27½ Waverley place. She had been seen clinically by inspecting commissioner on February 6, and also on February 9. When first seen clinically it was learned that she had been ill for three or four days, complaining of aching pains in ribs and

other bones, headache, and loss of appetite. She had no cough. Two days before she had felt very chilly. On examination she was found to have slight fever; pulse 100; tongue slightly coated; examination of thorax and abdomen negative; careful palpation of cervical, axillary, cubital, inguino-femoral, and popliteal lymph glands revealed no enlargement or tenderness. When seen on February 9 the patient was found to have grown much worse; the pulse was 132, and quick; the temperature was higher, the tongue was dry, sordes were appearing upon the lips, and the woman was semistupid and moaning in bed. The next day, February 10, the patient died, and the body was inspected on the following morning. The house in which the body lay was filled with men, women, and children, friends of the deceased, all of whom objected strenuously to any examination of the body whatever. It was insisted upon, however, and finally, by promising that only one small cut would be made, permission for examination was granted. Amid an appalling outbreak of grief on the part of the friends, an incision was made in one groin, and as the glands embedded in the fat there showed no hemorrhage or enlargement, no further examination was made. It is to be regretted in this case, where only one slight incision was allowable, that the spleen was not bacteriologically examined, as the case may have been one of general infection with *B. pestis*. At the time, however, in face of the strong protest made by the friends, it seemed wise, in order not to antagonize the Chinese too much and so perhaps interfere with the progress of the whole investigation, not to go further. The body was surrounded by quicklime and sublimate sheet, and burial was permitted by the board of health.

*Death 9* (inspected February 12).—Foong Ah Fong, female; age, 12; found dead at 747 Sacramento street (room No. 12), fourth floor. This little girl had been observed clinically on February 6, the first day of systematic clinical inspection. She gave a history of having caught a cold, followed by a headache and lack of appetite. She had complained of no chill or vomiting. Her pulse was 84, and her temperature only slightly above normal. She did not look very ill; the tongue was slightly coated; there was no palpable enlargement of lymphatic glands. As the splenic dullness was only slightly increased, and the mother of the child stated that the patient had been ill for fully two weeks, plague was not suspected. The case was looked upon as possibly a mild case of typhoid, and instructions were given to report to the Six Companies in case she got worse. She was not visited again during life. It was a surprise to hear of her death, and on inspecting the body, though no external signs of plague were visible, it was deemed advisable to make at least a bacteriological examination of the spleen. This was done, but under marked protest from the child's relatives. The result showed that the child was actually infected with *B. pestis* (*vide infra*—laboratory case 7).

*Death 10* (inspected Tuesday, February 12, 1901).—Ung Ah Buck; age, 45; found dead at Wing Hai's undertaking establishment on Sacramento street. This man had been seen alive and examined by Dr. Barker on the previous day, who diagnosed the case, *intra vitam*, as one of cervical bubonic plague. When seen alive he was in a room upstairs in the rear of 921½ Dupont street, opposite St. Louis alley. The man was sitting up, but looked extremely ill. His face was pale, cyanotic, and anxious looking. His voice was very feeble, but his intelligence seemed almost unclouded, and he was able to carry on a conversation, though with difficulty, with the interpreter. The friends stated that he had at times wandered in his talk. He was under the care of Dr.

Mather. The patient stated that he had been ill for two weeks. His neck had been swollen for one week and he regarded the condition as quinsy. With the aid of a tongue depressor the throat was examined. The fauces were swollen and reddened, the swelling being very marked in the left side. The left palatine tonsil was much enlarged and showed on its surface a grayish white patch the size of a dime. The reddening in the throat was general, and there was less local injection than one ordinarily sees in diphtheria. The left side of the neck was brownish yellow, having been painted over with a solution of iodine. On inspection and palpation marked bulging was found. This seemed to be due to enlargement of the cervical lymphatic glands. The case was diagnosed as one of plague, with cervical bubo. The man died next day, and a complete autopsy was made by Dr. Flexner. The pathological examination showed typical lesions of plague, and the bacteriological examination made by Dr. Novy demonstrated the presence of *B. pestis* (*vide infra*—laboratory case 8).

*Death 11* (inspected February 14).—Baby, 7 days old, found in undertaker's establishment on Clay street, having died at 717 Sacramento street. Advised making of cover-slip and cultures from umbilical stump and from spleen; reported negative as regards *B. pestis*.

*Death 12* (inspected February 15).—Ow Ah Lane; male, age, 55; coolie, who had worked at San Jose Junction, died at Kwang Chow "hospital," February 14, at 6 a. m. He had been ill for from six to seven months. No enlargement of lymph glands. Advised bacteriological examination of spleen. Reported negative as regards *B. pestis*.

*Death 13* (inspected February 16).—Male; body found at Quong Fook's undertaking establishment. Slight swelling in right groin. Pathological examination negative as regards plague. No bacteriological examination made.

It will be noticed that of the 13 deaths, which came to our attention, occurring from February 5 to February 16 inclusive, 6 were undoubtedly due to infection with plague. A seventh (death No. 8) may have been a case of plague which went unrecognized. The 6 undoubted deaths from plague occurred during the eight days from February 5 to February 12, inclusive. During the days, February 13 to February 16, inclusive, no new cases of plague or deaths therefrom were encountered.

Two of the deaths from plague occurred in the Chinese Theater on Washington street. The other four cases occurred singly in different parts of Chinatown. The accompanying map shows the location of 6 cases observed by your commissioners and also of those which have previously been regarded as plague by the city board of health.

The study of cases during life and the inspection of bodies after death proves that it is often difficult and under certain circumstances impossible to make a diagnosis of plague, even post-mortem, without bacteriological examination. In outspoken bubonic cases there will be but little, if any, difficulty in diagnosis, either *intra vitam* or post-mortem, provided the observer has had sufficient experience with the disease, but in the absence of primary buboes, the unskilled observer will miss practically every case and even the practitioner who has had much experience with plague may be deceived. Your commissioners feel sure, from experience with plague in Hongkong, India, and San Francisco, that once it is established that plague exists among the Asiatics of a town, every Asiatic who has fever should be suspected as a case of infection with plague until the disease is proven to be other than plague and every dead body should be treated as a plague cadaver until bacteriological



examination of glands, lungs, and spleen (including animal inoculation) has proven the absence from the body of the *B. pestis*. Only by such caution will it be possible to avoid missing actual plague cases.

In the following table are given the deaths per month occurring from all cases among the Chinese during the past four years as recorded by the city board of health. As data regarding the exact population of Chinatown at different times are not obtainable, it is difficult to institute comparisons of the mortality among the Chinese with that among the whites. It is obvious, however, that at no time during the past four years has the mortality rate among the Chinese increased to such an extent as to, in itself, cause alarm.

*Mortality among Chinese of San Francisco, 1897-1901.*

Months.	1897.	1898.	1899.	1900.	1901.	Months.	1897.	1898.	1899.	1900.	1901.
January .....	37	35	46	64	45	August .....	35	47	43	19	.....
February .....	46	36	39	48	.....	September .....	5	27	35	27	.....
March .....	38	46	37	47	.....	October .....	36	53	44	32	.....
April .....	35	41	33	30	.....	November .....	29	66	37	34	.....
May .....	27	34	36	42	.....	December .....	23	46	48	32	.....
June .....	30	21	46	25	.....	Total .....	430	477	478	488	45
July .....	39	25	34	38	.....						

*The pathological anatomy of the cases of bubonic plague met with in San Francisco.*

1. Human cases.
2. Experimental inoculations.

In the study of the pathology of the cases of plague met with among the Chinese in San Francisco, a number of disadvantageous circumstances were contended with. In the first place, owing to the peculiar prejudices of this people, prejudices born especially of their religious beliefs and practices, permission for post mortem examination is given with great reluctance. The opposition to all mutilation of the bodies of the dead is so great that consent for necropsies was obtained only after assurances that the examinations would be limited strictly to the actual necessities for the establishment of the diagnosis of the disease.

In the next place, there is no public mortuary in San Francisco to which the dead bodies were or could be carried. Such examinations as were made were conducted in the narrow limits of a dimly lighted alcove in an undertaker's shop or in the even worse habitations where the dead were found.

Under these circumstances, the post-mortem examinations left something to be desired on the score of completeness, although in every instance the important question whether death was caused by plague was answered definitely.

The majority of the dead did not exhibit well-marked buboes. Careful palpation usually was required in order to discover swellings and oedema of the groin. In all cases in which inguinal buboes were suspected or discovered incision was performed and the diseased glands and periglandular tissue, if present, removed.

With one exception (case 8) complete necropsies were not made. In all cases, however, the spleen was exposed and examined and parts removed. The tissues removed at necropsy were examined in three different ways.

1. Cultures upon agar-agar and cover-slips were made at once after removal.

2. The tissues were taken to the laboratory, where additional cultures and cover slips were prepared and examined.

3. Guinea pigs were inoculated with portions of the tissues.

Finally portions of the tissue were placed in alcohol for future study.

#### HUMAN CASES.

*Case 1.*—Chom Ah Chou; necropsy February 5, 8 p. m. Examination was made in the presence of one of us (Flexner) by Dr. Kellogg. The examination consisted in exposing and removing the inguinal and femoral glands on both sides. Incisions were made deep into the subcutaneous tissue, extending from Poupart's ligament about one-third the length of the thigh. The tissues on the left side were swollen and oedematous; the oedema was sero-hemorrhagic in character, and the lymphatic glands were hemorrhagic and greatly swollen. On the right side the oedema was less marked, and the glands, while distinctly enlarged and reddened, were less altered than those of the left side. Sections of these glands showed them to be uniformly hemorrhagic and swollen and to contain frequently necroses visible to the naked eye.

The spleen was fully twice the normal size. It was softer than normal, the capsule was wrinkled and the color deepened.

The further examination of these tissues was made after removal to the laboratory and participated in by Drs. Barker and Novy. The examination consisted in—

(a) Study of cover-slips stained in anilin dyes and treated by Gram's method.

(b) Preparation of cultures upon agar-agar separately by each member of the commission.

(c) Inoculation of guinea pigs with portion of tissue from the glands and spleen.

d. Preservation of tissues in alcohol for future study.

The examination of the cover-slips from the glands, periglandular tissue, and spleen showed large numbers of bacilli decolorizing by Gram's method and presenting the morphology of the *B. pestis*.

*Case 2.*—Lee Kee; necropsy February 5, 9 p. m., in the presence of Dr. Flexner, performed by Dr. Kellogg. No evidence of plague.

*Case 3.*—February 6, Lum Hong Yuen; autopsy made in Main Fook's undertaker shop; Drs. Kellogg, Novy, and Flexner present. Upon incision, the right groin from Poupart's ligament to the beginning of the middle third of the thigh, sero-hemorrhagic periglandular oedema and uniformly enlarged and reddened glands were found. The amount of fluid was considerable; although there was enlargement of all the glands, some of them reached to the size of a horse-chestnut. On section, these were of deep red color and soft consistence. Necroses were present.

The spleen was enlarged to fully double the normal size; it was softened and of a deep bluish red color.

Cultures and cover-slips were made at once by Dr. Novy and the excised tissues taken at once to the laboratory, where additional cultures were made, cover-slips examined, and animals inoculated.

The cover-slips showed large numbers of bacilli, having the morphology and staining properties of *B. pestis*.

*Case 4.*—February 6, Fong Sha Shong; necropsy by Dr. Kellogg, in the presence of Drs. Novy and Flexner. No evidence of plague.

*Case 5.*—Wong Chi Lui, February 7; necropsy by Dr. Barker, 6 p. m. Drs. Novy and Kellogg present.

On inspection, there was a swelling in the inguino-femoral region, which, on incision, revealed enlarged glands about the saphenous opening and in the groin. The largest gland had the size of an English walnut and was of a dark reddish-brown color; it was soft and juicy in consistence and mottled with hemorrhages and grayish-white patches of necrosis. The less swollen glands were markedly injected and contained hemorrhages. Periglandular tissue was very oedematous, the fluid running freely from the incision. The spleen was about twice the normal size, soft, and friable.

Cultures were made at once by Dr. Novy and cover-slips about one hour later at the laboratory, where at the same time animals were inoculated with portions of the tissue. The cover-slips from the spleen and the glands showed bacilli, presenting all the properties of *B. pestis*.

*Case 6.*—February 10, Tom Shom; necropsy by Dr. Kellogg, Drs. Barker and Novy being present.

There was a slight swelling in the right inguino-femoral region which, on incision, revealed slightly oedematous subcutaneous tissue, with slight enlargement of the glands. The largest gland had the size of a filbert, and its surface was dark and hemorrhagic; on section, it presented distinct hemorrhages; other glands were swollen, soft, juicy, and hemorrhagic. The spleen was enlarged, soft, and friable. The examination of the groin showed that the hypodermic puncture made for the withdrawal of fluid for diagnostic purposes during life had failed to enter a lymph gland.

Cover slips from the spleen and glands showed large numbers of bacilli having the characteristic properties of the *B. pestis*.

*Case 7.*—Foong Ah Fong, February 12; necropsy by Dr. Flexner, Dr. Barker present. The spleen only was examined; the organ was enlarged to about twice the normal size and was diminished in consistence. Cover-slips showed a very small number of bacilli of the size of *B. pestis*, although the characteristic polar staining was not observed. Cultures were made, and a portion of the spleen was introduced subcutaneously into a guinea pig.

*Case 8.*—Ung Ah Buck; autopsy February 12 at noon, at the undertaking shop of Wing Hai by Dr. Flexner, Drs. Novy, Barker, Kellogg, and Wilson being present. The left side of the face and neck presented a marked diffuse swelling, extending from the angle of the jaw backwards to the sterno-cleido-mastoid muscle and below, almost reaching the clavicle.

On incising this region the parotid gland was first reached; this organ presented a normal appearance. After dissecting away the parotid gland a group of greatly enlarged deep glands surrounding the carotid artery and jugular vein came into view. The periglandular tissue was infiltrated with bloody fluid and presented a sodden appearance. The enlarged glands and portions of the surrounding tissue were excised; the former were found to be swollen (several reaching the size of an English walnut) and to be wholly altered in appearance and consistence. In color they were deep purplish and on incision a hemorrhagic fluid exuded. Opaque points of necrosis were also present.

The general subcutaneous fat was well developed; there was no general oedema. Peritoneum appeared smooth and glistening; there was no excess of fluid in abdominal cavity and the abdominal glands were not noticeably swollen. The spleen was enlarged to fully twice its normal size; it presented a purplish color and its consistence was diminished. The pleural cavities were dry. The lungs retracted moderately upon removal of the sternum. The lower lobes of the lungs were congested,

but no consolidation was made out. No other abnormality was observed in the body.

The organs and tissues removed at this necropsy, consisting of the enlarged cervical glands and spleen, were taken to the laboratory, where cover slips, cultures, and animal inoculations were made.

The cover-slips from the spleen showed large numbers of a bacillus, having the morphology and staining properties of the *B. pestis*. The cover slips from the glands differed in their appearance. In some instances there were present large numbers of bacilli similar to those in the spleen, together with a few diplococci or short chains of cocci. Other cover slips showed besides the organisms mentioned a bacillus having the morphology of the *B. diphtheriæ*.

#### EXPERIMENTAL INOCULATIONS.

The animals used for experimental inoculations were half grown and grown guinea pigs. In order to guard against accidental infection of the locality, the animals were placed in glass jars, which in turn were placed in large crocks, the latter having been covered with wire netting covers, upon which the earthenware covers were placed. When an animal succumbed to the inoculation it was carefully removed from the jar and immersed for some time in 1-1000 sublimate solution. The jar itself was filled with a similar sublimate solution and the two left in contact for several days.

After subjecting the animals to necropsy, they were placed in the steamer and thoroughly steamed, after which the body was incinerated. Such portions of the tissue as were preserved for microscopical study were placed at once in 95 per cent alcohol.

Inoculations were made subcutaneously with bits of tissue from the tissue from the human cases and pure cultures of bacilli obtained from these sources. The usual procedure was to inoculate at least 2 animals from each human case; one with portions of the spleen and another with portions of the lymph glands. The cultures used were derived indifferently from the spleen and from the glands.

The inoculated animals can be separated into groups, depending upon the results of the inoculation. These results in turn depended upon the virulence of the material—tissue or culture—inoculated, upon which also depended the duration of life following inoculation.

It is important to state that characteristic lesions were obtained from inoculated material derived from every case in which bacilli were found in cover-slips including case 7 in which very small numbers of bacilli were detected in the spleen.

*Types of infection.*—The animals inoculated early in the course of the investigations died at periods varying from forty hours to eight days. Those inoculated later, and one or two inoculated with cultures early in the studies, but which have not succumbed, were etherized at the close of the work and subjected to post-mortem examination. According to the period of survival and virulence of the inoculated material, the appearances observed denoted (*a*) bacteræmia without microscopical localization in the organs and (*b*) focal, nodular localizations in the internal organs. In all cases marked local lesions at the site of inoculation and in the adjoining tissues occurred.

*Local lesion.*—At the point of inoculation the tissues—skin, subcutaneous tissue and sometimes muscles—were infiltrated with pus cells and presented a yellowish focus of necrosis. From this area as a center, the

subcutaneous tissue, sometimes of one side, but frequently of both sides, was occupied by gelatinous hemorrhagic infiltration.

The lymphatic glands of the inguinal and axillary regions were distinctly enlarged even in the acute cases. In those animals which died after a longer period or were killed from six to seven days after inoculation, the regional lymphatic glands were much enlarged, hemorrhagic, and even necrotic. The inguinal glands were, as a rule, more swollen than the axillary.

Cover-slip preparations from the local lesion—necrotic area, subcutaneous oedema, swollen lymph glands—showed large numbers of bacilli, having the characteristic morphology, staining, and reaction to Gram's method of the *B. pestis*. Cultures from these sources gave positive results.

In one animal in which the inoculation was made with a culture, the animal being etherized on the third day, there was slight local reaction only, no involvement of the regional lymph glands and no visible lesions in the internal organs having been observed. A small number of characteristic bacilli were found in cover-slips made from the site of inoculation.

*The spleen and liver.*—In the instances of rapid death (bacteræmia) the spleen was moderately large, its color was deepened, its consistence decreased, but no focal lesions were visible to the naked eye. Cover-slips and cultures showed numerous bacilli agreeing in characteristics with those of *B. pestis*.

In this class of cases, the other organs failed to show focal lesions. The lungs appeared mottled only, and a few small necroses existed in the liver; numbers of bacilli were contained in all the viscera and in the heart's blood.

The focal lesions in the spleen consist of grayish-white nodules, larger than a millet seed in size, covering the surface (within the capsule) and occupying the substance of the organ; when the nodules are numerous, as, *e. g.*, in animals succumbing from the sixth to the eighth day, or after etherization at that period, when there has been a marked local reaction, the spleen is greatly enlarged, perhaps five to six times its normal size and its color is pale. Cover-slips and cultures show a very large number of characteristic bacilli if the animal has died spontaneously, while if killed the number of bacilli upon cover-slips and cultures is far less.

The liver invariably showed lesions when death had been delayed a few days. The common ones were focal necroses of varying size. These were yellow in color, and in size ranged from that of a pin's point to linear and wedge-shaped areas 3 to 4 millimeters in length. Only rarely did whitish nodules similar to but smaller than those occurring in the spleen occur. The best example of nodular lesions in the liver was observed in an animal inoculated with a culture derived from case No. 1, the guinea pig having been etherized on the eighth day after inoculation.

*The lungs.*—The lungs presented a variety of appearances only one of which was characteristic. Some times they showed no microscopical lesion; not uncommonly, they were mottled and presented small ecchymoses beneath the pleura; rarely they contained scattered whitish nodules resembling those of the spleen, except that they were smaller and surrounded with a zone of recent hemorrhage. No effusion into the pleuræ were noted.

*Subserous hemorrhages.*—These were common especially in the peritoneum, where they occurred beneath and within the serosa of the large

intestine, and in the pleura covering the lungs. They were usually small in size, although at times through confluence, they reached larger dimensions. They did not give rise to an exudate or effusion into the serous cavities.

The other organs, except the adrenal glands, showed no especial changes to the naked eye. The adrenals were uniformly congested and often very dark in color and hemorrhagic.

The central nervous system was not examined.

#### BACTERIOLOGICAL EXAMINATIONS.

*Case 1.*—Chun Ah Chou, 814 Washington street; necropsy February 5. The spleen and left femoral glands were examined. These organs were found to contain enormous numbers of bacilli, having the morphological and tinctorial properties of *bacillus pestis*; thus, the short thick oval rods gave a bipolar stain with Loeffler's methylene blue or with carbolic thionin and were decolorized by Gram's method. Their pathogenicity was determined by inoculation of portions of the spleen and of a pure culture, subcutaneously, into guinea pigs.

Agar streaks made from the perfectly fresh organs showed many small white moist isolated colonies, having all the appearance of those of *bacillus pestis*. This was further confirmed by microscopic examination of living and stained preparations of such cultures. A few rapid growing colonies due to other forms of bacteria were present. Subcultures were made in glucose gelatin, bouillon, agar, salt agar, and milk. On agar in Petri dishes in twenty-four to forty-eight hours in the incubator, small white or grayish, moist colonies developed. These had finely granular center, with a smooth, sharply defined border.

The stab culture in glucose gelatin developed a slight growth along line of inoculation. On the surface the growth spread slightly, was grayish, moist in appearance, and had a slightly wavy, raised border. No gas was formed.

In bouillon, in twenty-four hours, a diffuse cloudiness was produced. The sediment was very slight, scarcely appreciable. Subsequently, a faint stringy deposit formed. The surface remained perfectly clear with a trace of a ring or collarette.

The streak cultures on nutrient agar presented a moderate grayish white moist growth which when touched with a platinum wire could be drawn out into strings.

On 5 per cent salt agar, the growth is very slight, scarcely visible, and shows the peculiar roundish or pyriform involution forms of the pest bacillus.

In milk the organism grows without producing any visible change in the medium.

The absence of gas production and of coagulation of milk, together with the macroscopic and microscopic characteristics, agreed fully with the characters of *bacillus pestis*. The effects on animals have been described in a preceding part of the report.

*Guinea pig No. 1.*—Was inoculated under the skin with a portion of the spleen from the above case. It died in thirty-six to forty hours. Cultures on agar made from the spleen and heart blood gave almost pure growths of the pest bacillus. Direct examination of the organs showed enormous numbers of typical plague bacilli.

*Guinea pig No. 2.*—Was inoculated subcutaneously with a pure culture obtained from the gland of above case. The animal died in three days. Plague bacilli were very numerous in the spleen and inguinal glands, and were also present in the heart's blood.

*Case 3.*—Lum Hong Huen, 28 Ross alley; necropsy February 6. Smear preparations from the spleen showed large numbers of short, thick rods, chiefly single; some oval or roundish forms were also present. The organisms stained readily with Loeffler's methylene blue or with carbolic thionin. In the latter case the bipolar staining was excellent. The organisms were completely decolorized by Gram. Cover-glass preparations from the gland likewise showed very numerous bacilli, occurring singly, taking the bipolar stain, but not that of Gram. Agar cultures were made at the time of the necropsy in the undertaker's shop of Main Fook. The cultural and morphological characteristics were the same as those observed in case 1.

*Guinea pig No. 3.*—Received subcutaneously a portion of the spleen from above case; died in five and one-half days. On autopsy, the spleen was found markedly enlarged, full of white nodules which were also present in the liver and in the lungs. Cover-glass preparations from the spleen showed enormous numbers of bacilli, having all the characteristics of *bacillus pestis*. Agar slants were inoculated with the heart's blood and spleen of this animal. The former yielded a slightly contaminated growth, but the culture from the latter was pure.

*Case 5.*—Wong Chi Lui, 21½ Waverly place; autopsy February 7. Streak preparations from the spleen showed very numerous pest bacilli apparently in pure culture; the predominating form was the short, thick rod, although some oval or roundish forms were present. Loeffler's methylene blue and carbolic thionin stained the bacilli readily, demonstrating the characteristic bipolar form. The organisms were completely decolorized by Gram. Similar preparations made from one of the left femoral glands show fewer organisms, but these in form, size, and staining reactions are identical with those found in the spleen. Cultures made on agar developed very slowly; on subsequent transplantation, however, the growth was more rapid, more abundant, and typical of that of *bacillus pestis*.

*Guinea pig No. 4.*—Was inoculated subcutaneously with a portion of the gland from the above case. Death resulted in three and one-half days. Bacilli were numerous in the spleen and corresponded in characteristics to those of the plague bacilli.

*Guinea pig No. 5.*—Was inoculated subcutaneously with a portion of the spleen; it was found dead three and one-half days later. Numerous plague bacilli were found in the spleen, heart's blood, and glands. Agar streaks from the heart's blood gave numerous small colonies of pest bacilli with a few larger colonies due to foreign organisms. The spleen gave numerous isolated small moist colonies, apparently a perfectly pure culture of the plague bacillus. Agar streak plates were made at the same time, and gave in twenty-four hours numerous minute colonies.

*Guinea pig No. 6.*—A portion of the spleen from this case was introduced into the peritoneal cavity. Death resulted in four and one-half days. Pest bacilli were abundant in the internal organs and in the glands. Agar streaks from the heart's blood gave a very limited growth, while that from the spleen was scarcely visible. In this and several other instances, difficulty was experienced in starting the growth of the organism directly from the tissues. Once started, however, with subsequent transplantations, better results were obtained.

*Guinea pig No. 7.*—Was inoculated subcutaneously with a loopful of a pure culture obtained from guinea pig No. 5. It died in two and one-half days. Necropsy revealed a hemorrhagic œdema, and cover-glass preparations of this showed pest bacilli mixed with numerous minute

diplo and streto cocci. The spleen was large and soft, contained nodules, and on staining cover-slips therefrom, enormous numbers of typical plague bacilli, apparently perfectly pure, were found. No diplococci were present.

*Case 6.*—Tom Shom, 814 Washington street; necropsy, February 11. During life some fluid was aspirated by means of a sterile syringe from the swelling in the right femoral region and transferred to nutrient agar. Blood was also drawn from the lobe of the ear and planted on agar. Stained preparations made from these specimens failed to demonstrate the presence of any organism. Cultures developed pyrogenic cocci, but failed to give any indication of pest bacilli. On necropsy, the femoral glands, though characteristic of plague, were found not markedly enlarged. It was evident that the aspirating needle, when introduced, had missed the gland proper, and the failure to isolate the pest bacillus during life in this can thus be explained. It should be noted that the periglandular tissue was but very slightly involved. Streak preparations made from the hemorrhagic gland showed relatively few typical plague bacilli. A long, thick bacillus was present in small numbers. Gram's stain was negative. Streak preparations from the spleen showed the pest bacillus to be present in large numbers and apparently pure. The organisms occurred singly, gave the bipolar stain, and were decolorized by Gram.

*Guinea pig No. 8.*—Was inoculated subcutaneously with a portion of the spleen from this case. Six and a half days later, though healthy in appearance, it was killed. A circumscribed caseous local lesion was found. There was a slight glandular enlargement on the same side. The spleen was slightly enlarged and showed white nodules. Pest bacilli having the short-rod and oval form were present in small numbers.

*Case 7.*—Fong Ah Fong, 747 Sacramento street; necropsy February 12. Streak preparations from the spleen revealed the presence of pest bacilli, although these were not very abundant; indeed, they were difficult to find in cover-slips. Typical bipolar staining rods and oval roundish forms were, however, found. Gram's stain was negative.

Streak cultures were made with the fresh spleen on agar slants, and at the same time agar plates were made. The agar streaks failed to give an appreciable growth, but on the plate a colony was found which corresponded to that of the plague bacillus. On microscopic examination it was observed to consist of small, short, oval, nonmotile rods, which decolorized by Gram. The colony transplanted to agar gave a typical growth of pest bacilli, and this culture was used to inoculate guinea pig No. 10.

*Guinea pig No. 9.*—Received a portion of the spleen of Fong Ah Fong subcutaneously. It died in four and one-half days. The spleen contained enormous numbers of pest bacilli, which stained in the usual bipolar manner and were decolorized by Gram. The heart's blood likewise contained the organism. Cultures were made on agar from the spleen and heart's blood of this animal; both gave numerous small, moist colonies of bacillus pestis.

*Guinea pig No. 10.*—Was inoculated subcutaneously with the agar culture mentioned above. It was killed two and one-half days later. The spleen showed only a few but characteristic pest bacilli. Under the skin there was but slight local change and a few typical bacilli were found.

*Case 8.*—Ung Ah Buck, St. Louis alley; necropsy February 12. Cover-slip preparations from the cervical lymph glands showed the presence of several distinct organisms. The short, thick, oval forms of the pest



bacillus were present in small numbers. With them was associated a large thick bacillus; there were also bacilli present resembling the bacillus diphtheriæ and a diplococcus closely resembling that of Fraenkel. The pest bacilli gave the usual bipolar stain with methylene blue and with carbolic thionin. Specimens stained by Gram's method showed deeply stained diplococci, the other forms being decolorized. Smear preparations from the spleen showed many organisms resembling the bacillus pestis morphologically.

Agar streaks from the fresh spleen gave a number of discrete moist colonies which consisted of large oval nonmotile bacilli, occurring singly and only occasionally in pairs; the streak cultures from the cervical gland also gave numerous isolated colonies. In both cases the cultures obtained were apparently perfectly pure and agreed in every respect with those of plague bacilli. The other bacteria seen in cover-slips did not grow. Agar plates yielded the same results.

*Guinea pig No. 11.*—Was inoculated subcutaneously with a small portion of the spleen from above case. In about three days the animal was very sick and was finally killed five and one-half days after inoculation. Bacillus pestis was found in the spleen and to a less extent in the blood.

The bacteriological examination of the foregoing 6 cases has, therefore, demonstrated the presence of the bacillus pestis in each.

SIMON FLEXNER,  
F. G. NOVY,  
LEWELLYS F. PARKER.

No.	Name.	Age.	Sex.	Color.	Place of death.	Date of death, 1900.
1	Wing Chut King.....	41	Male.....	Mongolian.....	1001 Dupont .....	March 6.
2	Chu Gan.....	22	.....do .....	.....do .....	723 Sacramento.....	March 15.
3	Ng Ach Ging.....	37	.....do .....	.....do .....	905 Dupont.....	March 17.
4	Lee Sun King.....	47	.....do .....	.....do .....	Oneida place.....	March 18.
5	Law An.....	38	.....do .....	.....do .....	St. Louis alley.....	April 24.
6	Lim Fa Muey.....	16	Female.....	.....do .....	739 Clay street.....	May 11.
7	Chu Sam.....	38	Male.....	.....do .....	717 Jackson.....	Do.
8	Chin Moon.....	16	Female.....	.....do .....	730½ Commercial ..	May 13.
9	Her Woon Jock.....	53	Male.....	.....do .....	740 Pacific.....	May 14.
10	Dang Hong.....	40	.....do .....	.....do .....	706 Pacific.....	May 29.
11	Chen Kney Kim.....	49	.....do .....	.....do .....	819 Clay.....	June 2.
12	Jay Man Tong.....	60	.....do .....	.....do .....	759 Clay.....	June 9.
13	Lee Wing Tong.....	40	.....do .....	.....do .....	767 Clay.....	July 6.
14	William Murphy.....	34	.....do .....	White.....	427 Dupont.....	August 11.
15	Ham Tan.....	29	.....do .....	Mongolian.....	900 Dupont.....	August 15.
16	Lea Do Hen.....	50	.....do .....	.....do .....	710½ Dupont.....	October 5.
17	Chun Yen.....	37	.....do .....	.....do .....	767 Clay.....	October 10.
18	Taik Dong Leong.....	39	.....do .....	.....do .....	705 Clay.....	October 14.
19	Young Moon Li Chee.....	30	Female.....	.....do .....	802 Dupont.....	October 31.
20	Young Wah Nui.....	9	.....do .....	.....do .....	802 Dupont.....	November.
21	Anne Roede.....	28	.....do .....	White.....	Pacific Hospital.....	November 3.
22	Lee Ho.....	30	Male.....	Mongolian.....	844 Washington.....	December 7.
23	Chun Wey Lung.....	60	.....do .....	.....do .....	780 Jackson.....	January 6, 1901.
24	Leam Wing Low.....	59	.....do .....	.....do .....	633½ Clay.....	January 15.
25	Angela Colombo.....	.....	.....do .....	White.....	5 Lafayette place ..	Do.
26	Chun Ah Choua.....	44	.....do .....	Mongolian.....	814 Washington.....	February 5.
27	Lum Hong Yuen a.....	37	.....do .....	.....do .....	28 Ross alley.....	February 6.
28	Wong Chi Lin a.....	50	.....do .....	.....do .....	15½ Waverley.....	February 7.
29	Tom Shom a.....	51	.....do .....	.....do .....	814 Washington.....	February 10.
30	Ng Ah Back a.....	45	.....do .....	.....do .....	St. Louis alley.....	February 11.
31	Poong Ah Fong a.....	12	Female.....	.....do .....	747 Sacramento St.....	February 12.

a Observed by commission.

NOTE.—Particular places of death of following numbers were as indicated below: No. 8, Pacific Hospital, Stockton and Chestnut streets; No. 13, City and County Hospital; No. 14, City and County Hospital; No. 21, Children's Hospital, 3700 California street; No. 25, City and County Hospital.

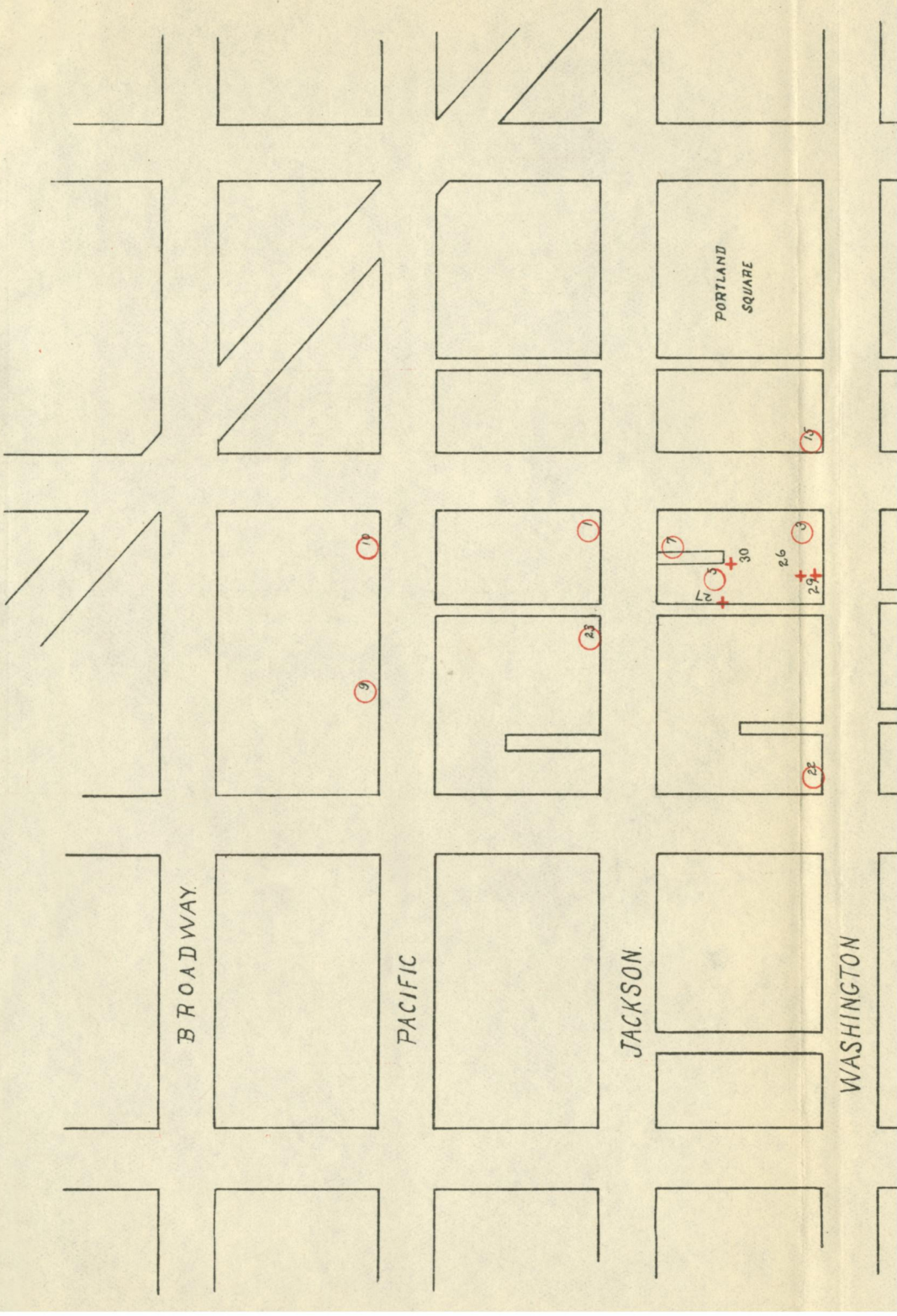
BROADWAY.

PACIFIC

JACKSON.

WASHINGTON

PORTLAND  
SQUARE



SQUARE

WASHINGTON

CLAY

SACRAMENTO

CALIFORNIA

COMMERCIAL

22  
26  
30  
29  
3

15

19 20

13 17 18 19 20

16

31  
+

11

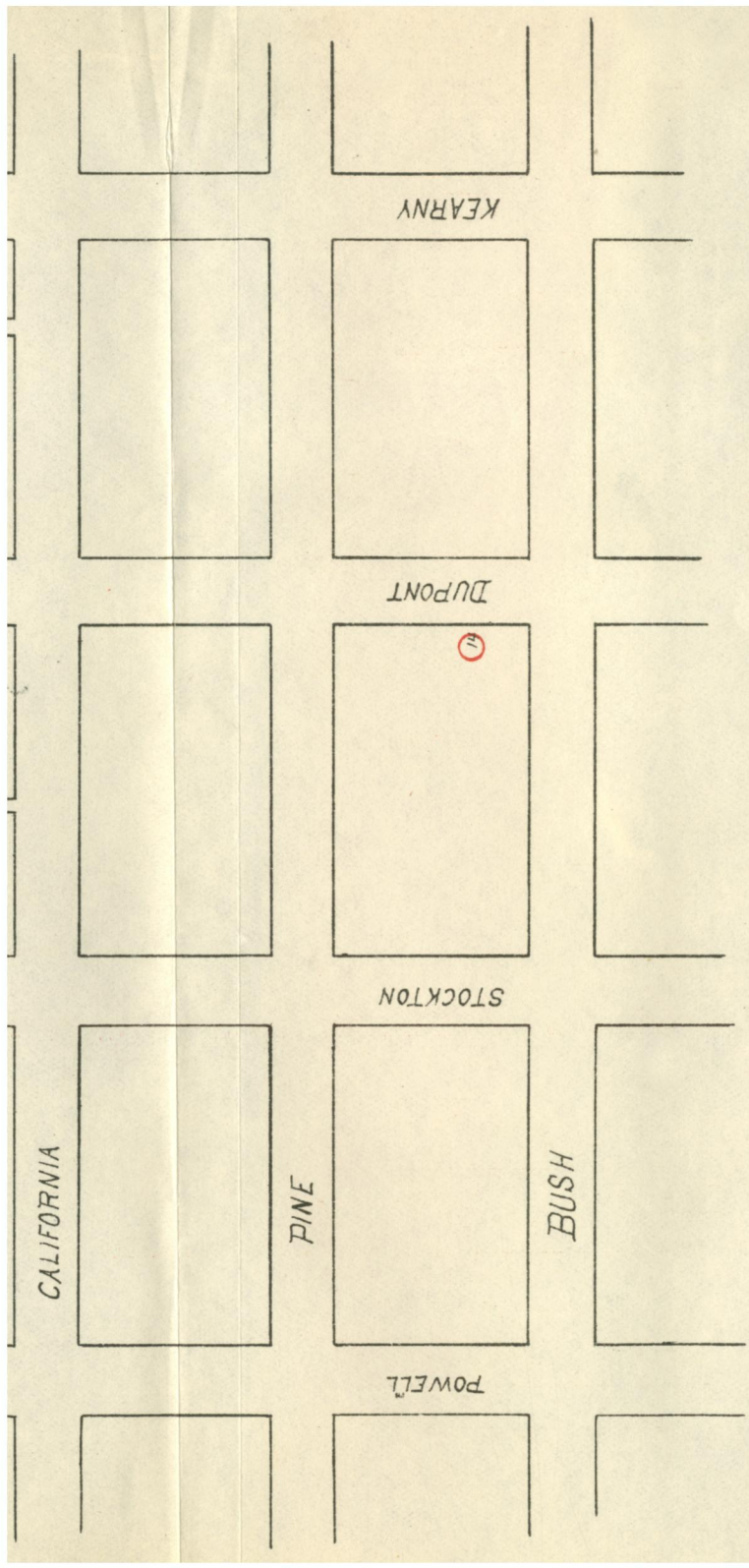
28  
+

24

4

18





MAP OF "CHINATOWN," SAN FRANCISCO.

RED CIRCLES—Cases seen and regarded as plague by City Board of Health before arrival of Commission.	RED CROSSES—Cases of plague observed by your Commissioners from February 5 to February 12, 1901.
-----------------------------------------------------------------------------------------------------	--------------------------------------------------------------------------------------------------